27 Clinical Symptoms, Cognitive Functioning, and Brain Health in Agricultural Workers

Jazmin M. Diaz, Stephen R. Kellam, Emily T. Sturm, Max Henneke, Emily Pehlke, John R. Duffy, Andrea Mendez-Colmenares, Agnieszka Z. Burzynska, Lorann Stallones, Michael L. Thomas
Colorado State University, Fort Collins, Colorado, USA

Objective: Agricultural workers are immersed in environments associated with increased risk for adverse psychiatric and neurological outcomes. Agricultural work-related risks to brain health include exposure to pesticides, heavy metals, and organic dust. Despite this, there is a gap in our understanding of the underlying brain systems impacted by these risks. This study explores clinical and cognitive domains, and functional brain activity in agricultural workers. We hypothesized that a history of agricultural work-related risks would be associated with poorer clinical and cognitive outcomes as well as changes in functional brain activity within cortico-striatal regions.
Participants and Methods: The sample comprised 17 agricultural workers and a comparison group of 45 non-agricultural workers recruited in the Northern Colorado area. All participants identified as White and non-Hispanic. The mean age of participants was 51.7 years (SD = 21.4, range 18-77), 60% identified as female, and 37% identified as male. Participants completed the National Institute of Health Toolbox (NIH Toolbox) and Montreal Cognitive Assessment (MoCA) on their first visit. During the second visit, they completed NIH Patient-Reported Outcomes Measurement Information System (PROMIS) measures and underwent functional magnetic resonance imaging (fMRI; N = 15 agriculture and N = 35 non-agriculture) while completing a working memory task (Sternberg). Blood oxygen-level dependent (BOLD) response was compared between participants. Given the small sample size, the whole brain voxel-wise group comparison threshold was set at alpha = .05, but not otherwise corrected for multiple comparisons. Cohen's d effect sizes were estimated for all voxels.
Results: Analyses of cognitive scores showed significant deficits in episodic memory for the agricultural work group. Additionally, the agricultural work group scored higher on measures of self-reported anger, cognitive concerns, and social participation. Analyses of fMRI data showed increased BOLD activity around the orbitofrontal cortex (medium to large effects) and bilaterally in the entorhinal cortex (large effects) for the agricultural work group. The agricultural work group also showed decreased BOLD activity in the cerebellum and basal ganglia (medium to large effects).
Conclusions: To our knowledge, this study provides the first-ever evidence showing differences in brain activity associated with a history of working in agriculture. These findings of poorer memory, concerns about cognitive functioning, and increased anger suggest clinical relevance. Social participation associated with agricultural work should be explored as a potential protective factor for cognition and brain health. Brain imaging data analyses showed increased activation in areas associated with motor functioning, cognitive control, and emotion. These findings are limited by small sample size, lack of diversity in our sample, and coarsely defined risk. Despite these limitations, the results are consistent with an overall concern that risks associated with agricultural work can lead to cognitive and psychiatric harm via changes in brain health. Replications and future studies with larger sample sizes, more diverse participants, and more accurately defined risks (e.g., pesticide exposure) are needed.

Categories: Cognitive Neuroscience
Keyword 1: brain function
Keyword 2: environmental pollutants / exposures
Keyword 3: neuroimaging: functional
Correspondence: Jazmin Diaz, Colorado State University, jazmin.diaz@colostate.edu

28 A Graph Theoretical Approach to Understanding Associations between Structural Connectivity and Improvements in Behavior of Children Born Very Preterm Following a Positive Parenting Intervention

Sandra Glazer[1,2], Nehal Parikh[1], Weihong Yuan[1], Ernest Pedapati[1], Peter Chiu[2], Shari Wade[1,2]

https://doi.org/10.1017/S1355617723011104 Published online by Cambridge University Press

[1]Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA. [2]University of Cincinnati, Cincinnati, OH, USA

Objective: Children born very preterm (VPT; <32 weeks gestation) are at increased risk for long-term neurocognitive sequelae such as behavioral problems. These problems may be caused by disrupted brain development, particularly white matter abnormalities that affect network efficiency, as shown via diffusion magnetic resonance imaging (dMRI). There is evidence that short-term interventions for pediatric clinical populations can lead to behavioral improvements as well as associated neuroplasticity. Adapted from a previous parenting intervention for families of young children with traumatic brain injury, the novel Building Better Brains and Behavior (B4) program teaches responsive parenting skills for families of children born preterm. It is hypothesized that parent-reported externalizing symptoms will improve from pre- to post-intervention and that these improvements will be mirrored by an increase in neural efficiency.
Participants and Methods: VPT children between the ages of 3-8 with documented behavioral problems were recruited to participate in a single-arm pilot clinical trial. Families began with a baseline visit in which the Child Behavior Checklist (CBCL) was administered as a measure of behavior problems, and the child underwent dMRI. Parents then participated in the 7-session intervention integrating self-guided, online learning modules with live virtual coaching sessions with a therapist. Twenty three participants enrolled, 15 of which completed the intervention and baseline MRI scan; 4 children were excluded from analysis due to not meeting eligibility criteria, leaving 11 participants for analysis of intervention effects (8 males, M_{age}=5.42). At program completion, families returned for a follow-up that entailed another CBCL questionnaire and dMRI scan. Eight children completed the post-intervention scan and five were retained for analysis (4 males, M_{age}=5.83). Imaging data was analyzed using the Brain Connectivity Toolbox, which generated graph theoretical metrics to characterize the topological organization of anatomical networks.
Results: A paired samples t-test showed significant reduction of externalizing behavior problems pre-intervention (M=61.12, SD=10.02) to post-intervention (M=55.00, SD=11.62; $t(10)=3.09$, $p=0.01$). At baseline, externalizing behavior problems were positively correlated with normalized clustering coefficient, $r(10)=0.59$, $p=0.04$, and small-worldness, $r(10)=0.64$, $p=0.03$. Change in externalizing symptoms pre- to post-intervention was positively correlated with baseline global efficiency, $r(4)=0.94$, $p=0.02$, and negatively correlated with mean local efficiency, $r(4)=-0.89$, $p=0.03$, and normalized characteristic path length, $r(4)=-0.89$, $p=0.03$.
Conclusions: Preliminary results indicate that VPT children who exhibit higher levels of externalizing symptoms show higher normalized clustering coefficient (which is expected of networks with less integration), and higher small-worldness (which is unexpected). Greater behavioral improvements were associated with higher baseline characteristic path length as expected, but lower baseline global efficiency; this may indicate that children who had lower global efficiency to begin with benefitted from the intervention the most. Due to the small sample size and lack of corrections for multiple comparisons, these results are not definitive and further research is needed to elucidate associations between structural connectivity and behavioral intervention in children born very preterm.

Categories: Connectomics
Keyword 1: pediatric neuropsychology
Keyword 2: prematurity
Keyword 3: connectomics
Correspondence: Sandra Glazer, Cincinnati Children's Hospital Medical Center and University of Cincinnati, glazersa@mail.uc.edu

29 Cultural Considerations for Neuropsychological Assessment and Cognitive Rehabilitation Planning in Patients Immigrating from China

Iris Yi Miao[1], Yuen Shan Christine Lee[2]
[1]Medical College of Wisconsin, Milwaukee, WI, USA. [2]New York University Langone Medical Center, New York, NY, USA

Objective: Research on healthcare disparities has found that racial and ethnic minority population were less likely to receive intensive and effective rehabilitation following an acquired

https://doi.org/10.1017/S1355617723011104 Published online by Cambridge University Press